centric cylinders, made of some hard wood (Fig. 1), the outermost 2 inches high, the others increasing in height by regular increments of 2 inches up to 18 inches. The cylinders are ¼ inch thick, except the innermost, which is a solid rod 1 inch in diameter: they are made so as to slide easily upon one another in any direction. The exposed portion of each cylinder, 2 inches in length, represents an internode, its upper edge a node. On the upper edge of each is fixed a small wooden knob (Fig. 1, 0–8) representing a leaf-insertion, and of such a size as to project slightly beyond the cylinder to which it is attached. By revolving the cylinders these knobs can be made to take up positions representing any divergence from ½ to ⅛; higher divergences would of course require a greater number of cylinders and consequently a larger and more unwieldy apparatus. In the figures the cylinders are shown adjusted to a divergence of ½. The adjustment is facilitated by holding above the model a straight wire in the case of ½ divergence, or a 3-, 5-, or 8-rayed wire star (Fig. 5, A, B, C) in the case of higher divergence. The genetic spiral is best shown by winding a piece of string round the model.

To explain the construction of the leaf-diagram, the whole apparatus is "telescoped" by simply lifting the lower cylinder: as the latter is raised each cylinder in turn is caught by the projecting portion of the leaf-knob of the next higher cylinder, until finally the upper edges—*i.e.* the nodes—of all nine are brought to one level, or in other words, the internodes are suppressed (Fig. 2). Then by observing the model end-on (Fig. 3), nine concentric circles are seen, each representing a node, and having a leaf-insertion in the appropriate position. To make this clearer, the upper edges of the cylinders are painted alternately light and dark, as in Fig. 3. The resemblance of the model in this position to the leaf-diagram is made still clearer by placing over it a straight wire or wire star (Fig. 5) to represent the orthostichies, and bring out the precise meaning of the angle of divergence.

For the illustration of whorled arrangements movable leaf-knobs are provided which can be inserted in small holes (Fig. 4, *b*, *c*, *d*) in the edges of the cylinders. By placing one of these movable knobs in *b* opposite to the fixed knob *a*, a 2-leafed whorl is produced; by placing knobs in *c* and *d*, a 3-leafed whorl. By revolving the cylinders successive whorls can be made either alternate or superposed.

I tried at first, some four years ago, a model having all the cylinders of the same height, each fitting rather tightly into the next lower one, which overlapped it about half an inch. But I found it impossible to get this arrangement to work satisfactorily, owing to the irregular contraction and expansion of the wood and the weight of the upper cylinders.

In addition to this model I find it very useful to have each divergence separately illustrated by a model having the form of a truncated cone 18 inches in height. The cone is painted white: black circles are drawn round it at regular intervals to represent nodes, on which black knobs are fixed for leaves: the orthostichies are painted yellow, and the genetic spiral red. In the case of the higher divergences these models are useful for showing the relations of the parastichies and the method of determining the divergence from them. Two secondary spirals running in opposite directions are made by passing two pieces of differently coloured string round the cone in opposite directions, each having a turn given to it round each leaf-knob in the parastichy it represents.

T. JEFFERY PARKER

Dunedin, N.Z., October 9

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—Dr. Vines has been appointed Honorary Secretary of the General Board of Studies for business connected with the lists of lectures issued by the Board.

Dr. A. S. Lea, Fellow of Gonville and Caius College, has been approved for and admitted to the degree of Doctor in Science.

A temporary iron dissecting-room for Human Anatomy is to be erected on space adjacent to the present Anatomical Schools. Over 145 men are engaged in dissection this term.

The honorary degree of Master of Arts has been conferred on Mr. Walter Heape, Demonstrator of Animal Morphology.

The Public Orator (Mr. J. E. Sandys), in presenting Mr. Heape for the degree, observed that Mr. Heape, *quantum inter lucrum et laudem intersit expertus*, had relinquished the brilliant prospects open to him in a mercantile career and had deliberately preferred to devote himself to scientific pursuits. In 1879 he was attracted to Cambridge by the high reputation of the late Mr. F. M. Balfour, and after working with him for three years in the newly-founded Morphological Laboratory, he had, during the three years that had elapsed since Prof. Balfour's lamented death, done good service as Demonstrator of Animal Morphology. In prosecuting his favourite studies he had considered nothing too small, nothing too great, for his attention; he had not only investigated the early development of the mole, but had also secured for the University Museum an exceedingly rare specimen of a wild male African elephant, which he had killed with his own hand in the South of Africa. "Magnum profecto est ultimâ ex Africâ spoliis opimis onustum redîsse; laudem vero majorem eidem distinat virtus—

"Diadema tutum
Deferens uni, propriamque laurum,
Quisquis ingentes oculo irretorto
Spectat acervos."

An examination for two minor Scholarships will be held at Downing College on June 1, 2, and 3, 1886. The examination in Natural Sciences will include most of the subjects of the Natural Sciences Tripos except Geology and Mineralogy, but no one will be examined in more than three subjects, and great weight will be attached to proficiency in one subject.

The Clothworkers' Exhibition of 52*l.* 10*s.* a year for Physical Science has been awarded to Mr. G. A. Shaw; the Exhibition of 30*l.* to Mr. J. Morgan.

The Antiquarian Museum is growing in value by the donations, both general and local, which it has received. The Curator, Baron von Hügel, has accomplished much in the arrangement of the objects, and has himself deposited valuable collections on loan.

SCIENTIFIC SERIALS

THE *Botanical Gazette* (Indianapolis) for September and October is chiefly occupied by a report of the papers read in the Botanical Section of the American Association for the Advancement of Science at its Ann Arbor meeting. These furnish satisfactory evidence of the good work doing in this branch of science on the American continent, and will not suffer from comparison with a similar record at any of the recent meetings of our own Association. The following are the titles of the papers read:—J. C. Arthur, proof that Bacteria are the direct cause of the disease in trees known as pear-blight.—C. R. Barnes, the process of fertilisation in *Campanula americana*.—C. E. Bessey, the question of bi-sexuality in the Zygnemaceæ.—C. E. Bessey, further observations on the adventitious inflorescence of *Cuscuta glomerata*.—T. J. Burrill, the mechanical injury to trees by cold.—D. H. Campbell, the development of the prothallia of ferns.—J. M. Coulter, on the appearance of the relation of ovary and perianth in the development of dicotyledons.—W. G. Farlow, notes on some injurious fungi of California.—E. L. Sturtevant, an observation on the hybridisation and cross-fertilisation of plants.—E. L. Sturtevant, germination studies.—As far as these papers are reported here, we may note Mr. Arthur's, Mr. Barnes's, Mr. Campbell's, and Mr. Coulter's as giving especially good evidence of a capacity for original work. Another interesting feature of this number is the report of the proceedings of the "Botanical Club," which held daily meetings during the session of the Association, with an attendance in all of no less than eighty-five members.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, November 19.—"On Variations in the Amount and Distribution of Fat in the Liver-Cells of the Frog." By J. N. Langley, M.A., F.R.S., Lecturer on Histology in the University of Cambridge.

The fat in the liver-cells is at its maximum amount in February and March. In April it rapidly decreases; from May until December it is present in comparatively small though varying amount.

Generally speaking, the fat globules form an inner zone in frogs which have hungered more than a week. In January, February, and March, however, the fat-globules are commonly more numerous in the outer part of the cells, often forming a distinct outer zone.

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In December, when the fat in the liver is increasing in amount, cold increases the amount of fat stored up, and warmth decreases it.

The increase of fat, consequent on a decrease of temperature, occurs chiefly in the outer part of the cells.

The decrease of fat, consequent on increase of temperature, occurs chiefly or wholly at the outer part of the cells; as a rule, the number of globules in the inner part of the cells is increased.

Variations of temperature have much greater effect on the amount of fat in the liver in winter than in summer.

The ratio of fat formed to fat metabolised, depends in part upon certain unknown conditions of the body, independent of temperature or of food.

When frogs are fed, *e.g.* with worms, the fat in the liver at first decreases; after some hours it begins to increase, and becomes greater than at the beginning of digestion; towards the end of digestion it decreases again in amount, so that in one or two days the amount is normal. Whilst the fat is decreasing in amount, the globules usually decrease in size; whilst the fat is increasing in amount, the globules usually increase in size, and are found in the outer region of the cells. Later, as the fat returns to normal, the globules form more and more an inner zone.

Probably the metabolism as well as the formation of fat is more rapid in the outer than in the inner cell-region; and probably also there is in certain circumstances a transference of fat-globules from the outer to the inner part of the cells.

Each separate fat-globule appears to be slowly metabolised in the same way that mesostate granules in secretory glands are metabolised.

From June to August, peptone or dextrin, when injected into the dorsal lymph-sac of a frog, produces changes like those produced by feeding.

Mathematical Society, December 10.—J. W. L. Glaisher, F.R.S., President, in the chair.—Mr. A. E. Haynes, Hillsdale College, Michigan, was elected a Member.—The following communications were made:—On the numerical solution of cubic equations, by G. Heppel.—On a theorem in kinematics, by J. Y. Walker, F.R.S.—Note on the induction of electric currents in an infinite plane current sheet which is rotating in a field of magnetic force, by A. B. Basset.

Chemical Society, November 19.—Dr. Hugo Müller, F.R.S., President, in the chair.—The following papers were read:—Aluminium alcohols; part 3, aluminium ortho-cresylate and its products of decomposition by heat, by J. H. Gladstone, F.R.S., and Alfred Tribe.—Notes on the constitution of hydrated and double salts, by Spencer U. Pickering.—Some new vanadium compounds, by J. T. Brierly.—On the action of PCl_5 upon ethylic diethylacetoacetate, by J. W. James.—On the vapour-pressures of mercury, by W. Ramsay, Ph.D., and Sydney Young, D.Sc. After criticising Regnault's determinations of the vapour-pressures of mercury, the authors show that his results do not agree with the following generalisation, which has been proved to be true in twenty-two instances. A relation exists between the absolute temperatures of all bodies, whether solid or liquid, whether stable or dissociable, which may be expressed in the case of any two bodies by the equation

$$R' = R + c(t' - t),$$

where R is the ratio of the absolute temperatures of the two bodies corresponding to any vapour-pressure, the same for both; R′ is the ratio at any other pressure, again the same for both; c is a constant which may equal 0, or a small plus or minus number; and t' and t are the temperatures, absolute or Centigrade, of one of the bodies corresponding to the two vapour-pressures. When $c = 0$, $R' = R$, or the ratio of the absolute temperatures is a constant at all pressures; and when $c > 0$ or $c < 0$, its values may readily be determined either by calculation, or graphically by representing the absolute temperatures of one of the two bodies as ordinates, and the ratios of the absolute temperatures at pressures corresponding to the absolute temperatures of that body as abscissæ. It is found in all cases that points representing the relation of the ratio of the absolute temperatures of the two bodies to the absolute temperatures of one of them lie in a straight line. From this it follows that if the vapour-pressures of any one substance are known throughout, it is sufficient to determine accurately the vapour-pressures of any other substance at any two temperatures, sufficiently far apart, in order to be able to construct its whole vapour-pressure curve. The vapour-pressures of mercury have accordingly been measured with the greatest care at the temperatures 222°·15 C., 270°·3, 280°·2, 447°, and 448°. On comparing the ratios of the absolute temperatures of mercury and water, at pressures corresponding to those temperatures, they are found to agree with the equation $R' = R + c(t - t')$, where $c = 0{\cdot}0004788$, if the temperatures of mercury be chosen as ordinates. It is therefore possible to construct the complete vapour-pressure curve of mercury; the paper contains tabular statements of the values.

Linnean Society, December 3.—Sir J. Lubbock, Bart., President, in the chair.—Sir H. E. Maxwell, Bart., Lieut.-Col. L. Blathwayt, and Messrs. R. A. Bastow, S. J. Capper, C. Ford, G. B. Howes, J. H. Gurney, jun., W. H. Jones, W. F. A. Lambert, C. T. Musson, W. D. G. Osborne, D. Petrie, and G. Thom were elected Fellows.—The President announced from the chair, and there were read letters from (1) the Elizabeth Thompson Science Fund, U.S.A.; (2) Prix de Candolle; (3) Medals and money prizes of Roy. Soc. N.S. Wales.—The Secretary exhibited for M. Buysman a preparation of the floral parts of *Aconitum Napellus*, L.—Mr. V. I. Chamberlain exhibited and made remarks on a specimen of trap-door spider and nest from California.—D. C. Cogswell showed oil-paintings of *Eugenia jambos* and *Casparea porrecta* from Bermuda.—The Rev. G. Henslow read a contribution to the study of the relative effects of different parts of the solar spectrum on the transpiration of plants. His conclusions are: that his experiments prove that Wiesner's results are correct, and that transpiration *per se* (theoretically distinct from the purely physical process of evaporation, which takes place from all moist surfaces and bodies, dead or alive) is especially, if not solely, referable to those particular bands of light which are absorbed by chlorophyll, and that such light, being arrested, is converted into heat, which then raises the temperature within the tissues and causes the loss of water. The only additional results advanced tentatively are, that yellow light has a *retarding influence* upon transpiration, and that "life" has a retarding influence upon evaporation as distinct from transpiration.—Prof. T. S. Cobbold's notes on parasites collected by the late Charles Darwin was next read. This contains a letter from Mr. Darwin when transmitting the author the specimens in 1869, followed by Dr. Cobbold's own memoranda concerning eight of them, only one, however, *Distoma incerta*, proving new.—A paper was read, on *Castilloa elastica*, Cerv., and some allied plants, by Sir J. D. Hooker. The author states that under the name *Castilloa elastica* probably more than one species exists. The true plant first described by Cervantes has flowered and fruited in Ceylon; it is now fully described and figured, with remarks on allied plants also yielding Panama india-rubber. Seeds collected by Mr. Cross in 1875 failed to germinate, but cuttings were also introduced, and from them plants were distributed to various colonies. Some difficulty is found in propagating by cuttings, as the side branches, which are deciduous, will not strike root, but seedlings have now been raised at Peradenyia, and the culture is therefore assured. An account of the introduction of the plant is appended.—A paper was read by Mr. P. H. Carpenter, on the variations in the form of the cirri in certain Comatulæ. The shape and number of the cirrus-joints of *Antedon phalangium* vary so greatly, both in the same individual and in individuals from different localities, that, if the two extreme forms were met with in an isolated condition, they would assuredly be referred to different species of *Antedon*. The cirri of this species are classed by the author under four types:—(A) long-jointed, (B) intermediate, (C) square-jointed, (D) short-jointed. A is the typical form which occurs in the Mediterranean variety, but is also found in the Atlantic specimens, together with B, and also, but more rarely, C; while D is confined to individuals from the Minch and the Ross-shire coast, occurring together with C, which is rare in examples from the Atlantic, except in those dredged by the *Dacia* on the Seine bank.—The Secretary summarised a paper, by Mr. Joseph Baly, on the Colombian species of the genus Diabrotica, and in which the author divides the genus into two sections, dependent on the lengths of the second and third joints of the antennæ.

Zoological Society, December 1.—Prof. W. H. Flower, V.P.R.S., President, in the chair.—Mr. F. Day exhibited and made remarks on a very curious fish, supposed to be a hybrid between the Dab (*Pleuronectes limanda*) and the Flounder (*P. flesus*).—Mr. Sclater laid on the table specimens of some rare birds sent for exhibition by Mr. Whitely, of Woolwich, and called special attention to a Hornbill which seemed to prove

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that *Buceros casuarinus*, described by Mr. G. R. Gray in 1871 from the head only, was merely the young stage of *Bycanistes cylindricus*.—Mr. E. Lort Phillips exhibited a fine series of heads of antelopes obtained during his recent expedition to Somali-land in company with Messrs. James, and read notes on their habits and localities.—Mr. W. T. Blanford exhibited, on behalf of Capt. C. S. Cumberland, the head of a wild sheep from Ladak, supposed to be a hybrid between *Ovis hodgsoni* and *Ovis vignei*.—Mr. John Bland Sutton read a paper on the origin of the urinary bladder, in which he endeavoured to show that the atrophy of the gills in all forms of the vertebrates above the amphibians might possibly be explained by the assumption of embryonic respiration by the allantois.—A communication was read from Lieut.-Col. Swinhoe, containing the fourth part of his memoir on the Lepidoptera of Bombay and the Deccan. The present paper concluded his description of the Heterocera; and also contained descriptions of the Tortricidæ and Tineina, which had been worked out by Lord Walsingham.—A communication was read from Dr. R. W. Shufeldt, containing a memoir on the comparative osteology of the Trochilidæ, Caprimulgidæ, and Cypselidæ. Dr. Shufeldt came to the conclusion that the Trochilidæ should form an order by themselves, and were not nearly related to the Cypselidæ, which were only much modified Passeres.—Mr. F. E. Beddard read the second of his series of notes on the Isopoda collected during the voyage of H.M.S. *Challenger*. In the present paper the author treated of specimens referable to the family Munnopsidæ.—A communication was read from Mr. Martin Jacoby, containing descriptions of some new species and a new genus of Phytophagous Coleoptera.

Physical Society, November 28.—Prof. F. Guthrie, President, in the chair.—Mr. T. H. Blakesley was elected a Member of the Society.—The following communications were read:—On the calibration of galvanometers by a constant current, by Mr. T. Mather. A current is passed through the coils of a galvanometer, which may be of any form; the galvanometer is turned in a horizontal plane through any angle, which need not be recorded, and the deflection θ of the needle noted. The current is then broken, and the needle swings back, taking up its position in the magnetic meridian; the angle through which it turns to do this is also noted δ. This is repeated with the galvanometer in various positions and with the same current, and a curve is drawn showing the relation between the values of $\frac{\sin\theta}{\sin\delta}$ and corresponding values of θ. When the instrument is now used in its normal position it is readily seen that a current producing a deflection θ of the needle is proportional to the value of $\frac{\sin\theta}{\sin\delta}$ corresponding to θ, obtained in the calibration experiment which may be read off at once from the curve.—On a machine for the solution of cubic equations, by Mr. H. H. Cunyngham. This machine the author believes to be the only one hitherto constructed that gives the imaginary as well as the real roots of a cubic equation. A cubical parabola is drawn upon paper, the ordinates being the cube roots of the corresponding abscissæ. To find the roots of a cubic, first reduce it by Cardan's rule to the form $x^3 - Ax - B = 0$. Then measure off along Ox, a distance equal to B, and from this point, T, draw a line making an angle equal to $\cot^{-1}A$ with Ox. The ordinates of the points where this line cuts the curve are the roots of the equation. To find the imaginary roots when they exist, first find the real root as before; from this point draw a tangent to the branch of the curve the other side of Oy, then if this line cut the axis of x at a point Q, and α be the real root, the two imaginary roots are

$$\frac{\alpha}{2} \pm i\sqrt{\frac{QT}{\alpha}}.$$

Instead of actually going through the construction as above, the operation is preferably performed by applying a protractor with a tangent scale to the curve with its centre at T, setting it, and leading off the point of the curve cut by its edge.—On a machine for the solution of equations, by Mr. C. V. Boys. After mentioning Mr. Hinton's apparatus, lately shown to the Society, and briefly describing Mr. Kempe's equation-machine, Mr. Boys explained a machine he had constructed, consisting of a system of beams, each provided with a pair of pans, and working upon a fulcrum at the middle. The pans of the first beam are marked $+a$ and $-a$, those of the second $-b$ and $+b$, the next $+c$ and $-c$, and so on. Into these, weights equal in value to the coefficients a, b, c, &c., of an equation $a + bx + cx^2 + \ldots = 0$ are to be placed. A sliding joint is arranged to connect a point opposite the positive pan of each beam, with a rib at the back of the next lower one. Alternate beams are placed opposite one another, and each set can be slid past the other, the peculiar connecting-joints being able to slide past the fulcra and the pans on each beam. To solve an equation, the coefficient weights are placed in their pans, and the two sets of beams are made to slide past one another. At certain positions the beams change the direction of inclination. These positions of balance are noted on a scale, the readings of which are roots of the equation. When there are not more than two impossible roots, the machine will find them; for this purpose the real roots are first found and divided out, the resulting quadratic being placed on the machine. Instead of a change of inclination of the beam, a maximum or minimum of pressure is observed by a spring balance. The reading of the scale is then the real part of the root, and the square root of the pressure the impossible part.—Mr. A. Hilger exhibited and described a new driving clockwork of isochronous motion regulated by a fan-governor, and a new direct-vision spectroscope.

Geological Society, November 8.—Prof. T. G. Bonney, F.R.S., President, in the chair.—Henry M. Ami and R. Mountford Deeley were elected as Fellows of the Society.—The following communications were read:—Results of recent researches in some bone-caves in North Wales (Fynnon Beuno and Cae Gwyn), by Henry Hicks, F.R.S., with notes on the animal remains by W. Davies, F.G.S., of the British Museum (Nat. History). This paper contained the results of researches carried on in these caverns in the summers of 1883, 1884, and 1885 by Mr. E. Bouverie Luxmoore, of St. Asaph, and the author. The enormous collection of bones belonging to the now extinct animals of Pleistocene age obtained had been submitted for examination to Mr. W. Davies, and afterwards distributed to various museums. Several well-worked flint implements were also discovered in association with the bones. The following are the conclusions arrived at by the author, from the facts obtained during the explorations:—That abundant evidence has been furnished to show that the caverns had been occupied by hyænas, and possibly by other beasts of prey, as dens, into which portions of carcasses of various animals had been conveyed in Pleistocene times. The very great abundance of some animals, such as the rhinoceros, horse, and reindeer, and the frequent presence of bones belonging to young animals, proved that the plain of the Vale of Clwyd, with that extending northward under the Irish Sea, must have formed a favourite feeding-ground even at that time. The flint implements and worked bones showed also that man was contemporary with these animals. The facts perhaps, however, of greatest importance, made out during these researches, are those which bear on some questions of physical geology in regard to this area, which hitherto have been shrouded more or less in doubt. The views on the physical conditions in Pleistocene times of the areas in North Wales in which these and the other bone-caverns occur, so ably put forward by Sir A. Ramsay, appeared to the author to be strongly supported by the results obtained in these explorations. The ravine in which the caverns occur must have been scooped out previous to the deposition in it of the glacial sands and boulder-clays. This sand and clay, there seems good evidence to show, must have filled up the ravine to a height above the entrances to the caverns, and such sands and clays are now found at some points to completely fill up the caverns. How, then, did these sands and clays get into the caverns? Were they forced in through the entrances by marine action or by a glacier filling the valley? Or were they conveyed in subsequent to the deposition of the boulder-clay in the valley and surrounding area? The position of the caverns in an escarpment of limestone, at the end of a ridge of these rocks, with a sharp fall on either side, prohibits the idea that the material could have been washed in from the higher ground, as has been suggested by some in the case of other caverns, if it had anything like its present configuration. Moreover, there is scarcely any deposit now visible upon the limestone ridge, and there is no certainty that there ever was deposited there any great thickness of such a clay as that now found in the caverns. The general position also of the bones in some of the tunnels seems to indicate clearly that the force which broke up the stalagmite floor, in some places 10 to 12 inches thick, and stalactites 6 to 8 inches across, which thrust many of the large and heavy bones into fissures high up in the caverns and placed them at all

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angles in the deposit, must have acted from the entrance inwards, and the only force which seems to meet these conditions is marine action. The following seem to the author to be the changes indicated by the deposits. The lowest in the caverns, consisting almost entirely of local materials, must have been introduced by a river which flowed in the valley at a very much higher level than does the little stream at present. Gradually, as the valley was being excavated, and the caverns were above the reach of floods, hyænas and other beasts of prey occupied them, and conveyed the remains of other animals into them. Man also must have been present at some part of this period. Gradually the land became depressed, the animals disappeared, stalagmite was formed, and the sea at last entered the caverns, filling them up with sands and pebbles, and burying also the remains not washed out. Floating ice deposited in this sea the fragments of rocks derived from northern sources, and these became mixed with local rocks and clays brought down from surrounding areas. The greater part of the boulder-clay in the Vale of Clwyd was probably deposited as the land was being raised out of this Mid-Glacial sea. During the process of elevation the caverns became again disturbed by marine action and the upper fine reddish loam and the laminated clays were deposited. It seemed to the author impossible to avoid the conclusion that these caverns must have been submerged, and afterwards elevated to their present height of about 400 feet above the level of the sea, since they were occupied by Palæolithic man and the Pleistocene animals.—On the occurrence of the Crocodilian genus *Tomistoma* in the Miocene of the Maltese Islands, by R. Lydekker, F.G.S.—Description of the cranium of a new species of *Erinaceus* from the Upper Miocene of Œningen, by R. Lydekker, F.G.S.

Anthropological Institute, Nov. 24.—Mr. Francis Galton, F.R.S., President, in the chair.—The election of W. Seton Karr, E. Lawrence, Dr. R. Munro, and Dr. W. Summerhays, was announced.—Mr. C. H. Read exhibited a number of ethnological objects from Terra del Fuego.—The President exhibited on behalf of Dr. J. E. Billings, of the United States Army, a collection of composite photographs of skulls. There were in all twenty photographs, forming four series, referring respectively to Sandwich Islanders, Ancient Californians, Arapahoe Indians, and Witchitaw Indians; each composite was the mean of six adult male skulls.—Dr. Edward B. Tylor exhibited some Australian Tunduns or bull-roarers, and explained the manner in which they were used.—Mr. J. Theodore Bent read a paper on insular Greek customs, in which he described many ceremonies now used by the Christian inhabitants of the islands of the Ægean Sea that were obviously derived from, or survivals of, ancient Pagan customs. Mrs. Bent exhibited a collection of Greek dresses, drapery, and other objects from the islands referred to in the paper.—Mr. J. W. Crombie read a paper on the game of hop scotch, in which he traced the origin of the game to a period anterior to the introduction of Christianity, and showed that in early Christian times children had some rough idea of representing in this game the progress of the soul through the future world, and that the division of the figure into seven courts was on account of the belief in seven heavens.—Dr. E. B. Tylor gave a *résumé* of a paper by Mr. A. W. Howitt, on the migrations of the Kurnai ancestors (Gippsland).

Royal Microscopical Society, November 11.—Rev. Dr. Dallinger, F.R.S., President, in the chair.—The President referred in feeling terms to the death of Dr. W. B. Carpenter, C.B., a Fellow, and formerly President, of the Society, and a resolution of condolence with his family was passed. Prof. Stewart was appointed to represent the Society at the funeral.—Mr. Beck exhibited a portable form of his "Star" microscope, and Mr. Crisp exhibited a microscope with focussing adjustment by means of a piece of catgut, which, it was claimed, gave a very simple and easy motion.—Mr. J. Mayall, jun., exhibited the Helot-Trouvé electric photophore, which had been recommended as an excellent illuminant for microscopical purposes.—Mr. Groves exhibited a Barrett microtome, a very large form, intended for cutting sections of exceptional size.—Mr. Dowdeswell exhibited a cholera bacillus showing a flagellum at either end, one straight and the other coiled.—Mr. Nelson exhibited a very fine image of *Triceratium septangulatum*, showing markings in the areolation with a $\frac{2}{3}$-inch objective, and the low aperture of 0·29.—Mr. Badcock described an unknown fresh-water organism, closely resembling a Polycystin. The President suggested that it might possibly be one of the various forms of *Actinophrys*.—A paper was read by Mr. W. B. Turner, describing some new and rare Desmids; also one, by Dr. Giltay of Holland, on the proper mode of describing the amplifying power of a lens or objective.—Mr. Crisp read a paper on the limits of resolution in the microscope, in which he showed that whilst the limit with white light might be taken at 146,543 lines to the inch, the use of monochromatic light gave an increase to 158,845, and with photography to 193,037.—A paper was read by Dr. Lavis on preparing sections of pumice and other vesicular rocks.—It was announced that Mr. Mayall, jun., was about to give a course of five lectures on the microscope at the Society of Arts, illustrated by microscopes from the Society, and from Mr. Crisp's extensive collection.

Mineralogical Society, December 8.—L. Fletcher, M.A., President, in the chair.—The following papers were read:—On a glaucophane eclogite from the Val d'Aoste, by the Rev. Prof. Bonney, F.R.S.—Note on orthoclase from Kilima-njaro, by H. A. Miers, M.A.—Preliminary notice of penetration twins of arragonite from New Mexico, by R. H. Solly, F.G.S.—On some specimens of idocrase and garnet from the neighbourhood of Tzermatt, by Prof. W. J. Lewis.—Dr. Burghardt exhibited some pseudomorphs of native copper after arragonite, from South America.—Mr. Miers also exhibited some peculiar twins of calcite from Eyam, Derbyshire.

Entomological Society, December 2.—Mr. J. W. Dunning, Vice-President, in the chair.—Two new Fellows were elected.—Mr. F. Enock described experiments in mounting *Mymaridæ*, and exhibited photographs of the insects.—Mr. A. Eland Shaw exhibited an undetermined species of *Conicephalus*, which had been taken in a hothouse at Birmingham; it was believed to be an Australian or South American species.—Mr. G. T. Porritt exhibited two species of a melanic variety of *Ayrotis obelisca* from Sligo.—Mr. Dunning read a note on the election of honorary foreign members.

Victoria Institute, December 7.—A paper on the unreasonableness of agnosticism was read. The author treated the subject in such a manner as to make his essay specially valuable at this time.—Mr. E. Charlesworth read a paper on the skull of the gorilla, of which he exhibited a specimen considered the most perfect that had as yet reached England.

Cambridge

Philosophical Society, November 23.—Prof. Foster, President, in the chair.—The following communications were made:—On a new method of producing the fringes of interference, by L. R. Wilberforce, B.A. The author stated that in the course of an inquiry into the suitability of various forms of interference-fringes for certain investigations on the velocity of light upon which he had been engaged, he had been led to adopt the mode of production which was the subject of his paper. He briefly described the method, indicated the elements of its theory, and, by a comparison of his results with those of former experimenters, showed the great increase of accuracy attainable by means of it.—On the dielectric strength of mixtures of gases, by Dr. C. Olearski. The author described a series of experiments from which it followed that the dielectric strength of a mechanical mixture of two gases is intermediate between the strengths of its constituents.—On the mutual action of oscillatory twists in a vibrating medium, by A. H. Leahy, M.A.—On the transpiration stream in cut branches, by F. Darwin, M.A., and R. W. Phillips, B.A. The paper consists chiefly of an experimental criticism of Dufour's experiments on transpiration. The authors show that (contrary to Dufour's contention) there is an essential similarity between the natural current of water in a transpiring branch, and the current induced by pressure in a similar specimen; this similarity being understood to hold good under the conditions of Dufour's experiments, namely, when certain incisions are made, or when the branch is compressed in certain ways.

Paris

Academy of Sciences, December 7.—M. Jurien de la Gravière, Vice-President, in the chair.—Determination of the differences of longitude between Paris, Milan, and Nice, by MM. F. Perrier and L. Bassot. The values obtained for the differences of longitude between the observatories of these places is found to be:—

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Milan–Paris ...	+27m. 25·315s.		
Paris–Nice ...	−19m. 51·513s.	27m. 25·325s.	Δ=0·01s.
Nice–Milan ...	− 7m. 33·812s.		

—Movement of the molecules of the so-called "solitary wave" propagated on the surface of a stagnant canal, and which after some agitation acquires a constant and uniform motion, by M. de Saint-Venant.—Experimental researches undertaken to determine the influence exercised by lesions of the spinal marrow on the form of the convulsions assumed by artificial epilepsy of cerebral origin, by M. Vulpian.—On the theory of algebraic forms in connection with M. Halphen's differential invariants, by M. Sylvester.—Note on the fresh experiments carried out in 1885 with the navigable balloon *La France*, by M. Ch. Renard. The results of three ascents during the months of August and September gave a mean velocity of about 6·7 metres per second, with 55 to 57 revolutions of the screw per minute. On the two last occasions the balloon was brought back to the point of departure, Chalais, near Meudon.—On the propagation of motion in an undefined fluid (1st part), by M. Hugoniot.—Discovery of a new comet in the constellation Andromeda at the Paris Observatory on December 1, by M. Fabry.—Observations made at the Observatories of Paris, Bordeaux, Lyons, and Algiers, presented by M. Mouchez.—On the employment of spherical convex glasses (boules-panorama) as solar signals, by M. Hatt.—Note on certain hyper-Fuchsian functions, by M. E. Picard.—On Lagrange's form of interpolation, by M. Bendisson.—Note on the trigonometric series, by M. H. Poincaré.—On the solutions common to several partially-derived linear equations, by M. R. Liouville.—On the holomorphous conditions of the integrals of the iterative equation, and on some other functional equations, by M. G. Kœnigs.—Remarks relative to a preceding communication on M. Kœnig's theorem, by M. Ph. Gilbert.—On the part played by the rotation of the earth in determining the deviation of running waters on the surface of the globe, by M. Fontes. The author considers it now demonstrated that terrestrial rotation has a perceptible influence on the tendency shown by rivers to corrode one side or the other of their banks.—Note on the spectrum of absorption of oxygen, by M. N. Egoroff. The results of the author's spectroscopic researches, combined with those of M. Thollon, completely explain the origin of the telluric bands in the section A—*b* of the solar spectrum; 126 bands, distributed in equal proportion and identically in the groups A, B, and α, depend exclusively on oxygen, while the others belong to the vapour of water.—On the characteristic equation of carbonic acid, by M. E. Sarrau.—On the preparation of hypophosphoric acid, by M. A. Joly.—Note on some properties of zinc, by M. L. L'Hôte. Pure zinc, alloyed with a very small quantity of arsenic or antimony, conducts itself in water like zinc alloyed with iron. Hence all the zincs of commerce decompose water at the boiling-point.—Heat of combustion of some ethers of organic acids: ethylic ether of lactic acid, citrate of ethyle, normal ethylbutyric ether, ethylisobutyric ether, by M. Louguinine.—On the pyrogenous decomposition of the polyatomic acids of the fatty series, by M. Hauriot.—On the normal and primary monochloruretted butyric compounds, by M. Louis Henry.—Action of chlorine on anhydrous chloral, by M. Henri Gautier.—Analysis of the deposits formed by the mineral waters of Chabetout, Puy-de-Dôme, by M. Fr. Thabuis. The chief constituents of the deposits from these ferruginous waters are sesquioxide of iron, nearly 50 per cent.; organic matter, 9·4; lime, 2·2; gelatinous silica, 11·1; carbonic acid, 1·8.—Optical examination of some little-known minerals: kirwanite, a silicate of the protoxide of iron, lime, and alumina, with about 4 per cent. of water; hullite, consisting mainly of amorphous matter, and found in the Irish basaltic rocks; harringtonite, a zeolithe of lime and soda; bowlingite, a hydrosilicate of alumina, iron, and magnesia; botryolite, identical with datholite, by M. A. Lacroix.—On experimental denutrition, by M. Ch. E. Quinquand. This process, which consists in *starving* an organ, or part of an organ, supplies a new and useful method of investigation, enabling physiologists to advance the study of elementary nutrition and of the fundamental action of medicines.—On the effects produced by the ingestion and intra-venous injection of some colouring substances derived from coal, and much used in colouring drinks and aliments, by MM. P. Cazeneuve and R. Lépine. One of these (binitronaphthol, or Manchester yellow), is shown to be distinctly injurious; the other two derived from it quite harmless.—On the anatomy, digestive, and nervous systems of the genus Discina, by M. L. Joubin.—Account of a young megaptera recently stranded in the maritime district of La Seyne (Mediterranean), where this species of whale is extremely rare, by M. G. Pouchet.—On the respiration of plants, continued, by MM. G. Bonnier and L. Mangin.—On the desiccation of plants immersed in aqueous solutions, by M. Albert Levallois.—On the processes of fructification of the various genera of sigillaria, by M. B. Renault.—On the underlying rocks of the Tertiary formations in the neighbourhood of Issoire, Auvergne, by MM. Michel Lévy and Munier-Chalmas.—Geological observations on the kingdom of Shoa and Galla country, south of Abyssinia, by M. Aubry.—Note on the discovery of phosphates of lime made in the spring of the present year in the lowest Tertiary strata in the south of Tunis, by M. Philippe Thomas.—On the Jebel Zaghwan range, Tunis, and on the great fault in this orographic system running north-east and south-west, and indicating the line of upheaval of the lower chalk formations now in contact with the Upper Eocene rocks, by M. G. Rolland.—Note on the discovery of a human station dating from the Stone Age in the woods of Clemert, by M. Emile Rivière.—On the advantages to be derived from a thorough knowledge of the displacements of the Gulf Stream in weather forecastings, by M. de Tastes.—Various communications on the shooting stars of November 27, from M. Stephan, of the Marseilles Observatory; M. Hirn, of Colmar; M. Colladon, of Geneva; M. Perrotin, of Nice; M. Quenin, of Pelonne (Drôme); MM. Hildebrandsson and Charlier, of Upsala; M. Phipson, of London; and others, with remarks by M. Faye.

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